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Secondary metabolites in the leaves of *Tradescantia pallida*

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Abstract
Tradescantia pallida has also been traditionally used as a medicinally. It is an ornamental plant for its striking purple foliage. The genus *Tredescantia pallida* has highly resistance to climate condition and environmental factors. *T. pallida* leaves have been acted as anodes against rheumatism and joint paint and act as dyes. The literature has often shown that this species is an excellent bioindicator of air pollution levels. Tredescantia pallida has been reported to have spatial and seasonal bio monitoring feature for release of metals from vehicle pollution. It is a household plant has been refereed extremely effective in improving indoor air quality by filtering out volatile organic compounds, the phenomenon is known as phytoremediation. Due to the occurrence of numerous dynamic compounds, plants perform diverse functions. Some of these are alkaloids, pigments, flavonoids, phenolic, terpenoids and essential oils. It has been reported that plant extract flavour several activities like growth promotion appetite stimulation, enhancement of tonicity, antistress, antimicrobial, antioxidant, aphrodisiac, immune stimulating, maturation of culture species as well as anti-pathogen properties. So, *Tradescantia pallida* which are mainly used as an ornamental plant to find out the presence of notable compound presence and to justify the claim and provided in traditional medicinal in a more precise and accurate approach of science. In this study we evaluate the phytochemicals investigation on *Tradescantia pallida*. Which have high of growth.

Keywords: *Tradescantia pallida*, alkaloids, flavonoids, phenolic, terpenoids

Introductions
Medicinal plants have been used for the treatment of ailments and diseases due to their well-tolerated effect, low cost, accessibility, and being free from serious adverse effects. In the recent year, there has been a global interest in medicinal plants, and concern regarding the usage of the correct medicinal plants always remained in question due to the lack of appropriate standardization and authentication parameters, which are necessary to ensure the purity and quality of herbal drugs. Further, substitution and adult rations in herbal drugs have now become a major problem due to absence of standards relating to originality of drugs. *Tradescantia pallida* (Rose) D. R. Hunt (Fig. 1), a member of the Commelinaceae family is a herbaceous ornamental perennial plant, locally known as Setkrisia Ungu or Purple Queen is commonly distributed in tropical and subtropical regions

Secondary metabolites in plants are mostly responsible for their antimicrobial activity. Phytochemicals that possess antimicrobial properties are phenolic and polyphenols (flavonoid, quinones, tannins, Coumadin's), terpenoids, alkaloids, lections, and polypeptides. Phytochemicals can act by disrupting the microbial membrane or improving cellular metabolism.

Since ancient time, these secondary metabolites of plant have used by humans in various fields, including medicines and gastronomy. The vast chemical diversity of plant secondary metabolites and their long history of traditional use make plants very attractive natural reservoir for research into the discovery of new antimicrobial compounds.

Taxonomical classification of *Tradescantia pallida*

Kingdom	Plantae
Phylum	Spermatophyte
Sub phylum	Angiospermae
Class	Monocotyledonae
Order	Commelinales
Family	Commelinaceae
Genus	Tradescantia
Species	Pallida

Fig 1: *Tradescantia pallida*

Secondary metabolites

Secondary metabolites are substance manufactured by plants that makes them competitive in their own environment. These small molecules exert a wide range of effect on the plant itself and on other living organism.

Secondary metabolism produces large number of compounds do not necessary in the growth and development of plants but required for the plant to survive in its environment. Secondary metabolism are essential for communicating with other organism in mutualistic or antagonistic interaction. They are often play an important role on plant defense against herbivores and other.

Secondary metabolites were thought to be simply functionless end product of metabolism, or metabolic waste.

They have important ecological functions in plants

- They provide protection against being infected by microbial pathogen and being eaten by herbivores.
- They serves as attractant (odor, color, taste) for seed dispersing animals and for pollinator.

The ability of plants to complete and survive is therefore affected by the ecological functional of their secondary metabolites. They are also relevant to agriculture. The very defensive compounds that increase the reproductive may also make them undesirable as food for humans. Many important crop plants have been artificially selected to produce relatively low levels of these compounds

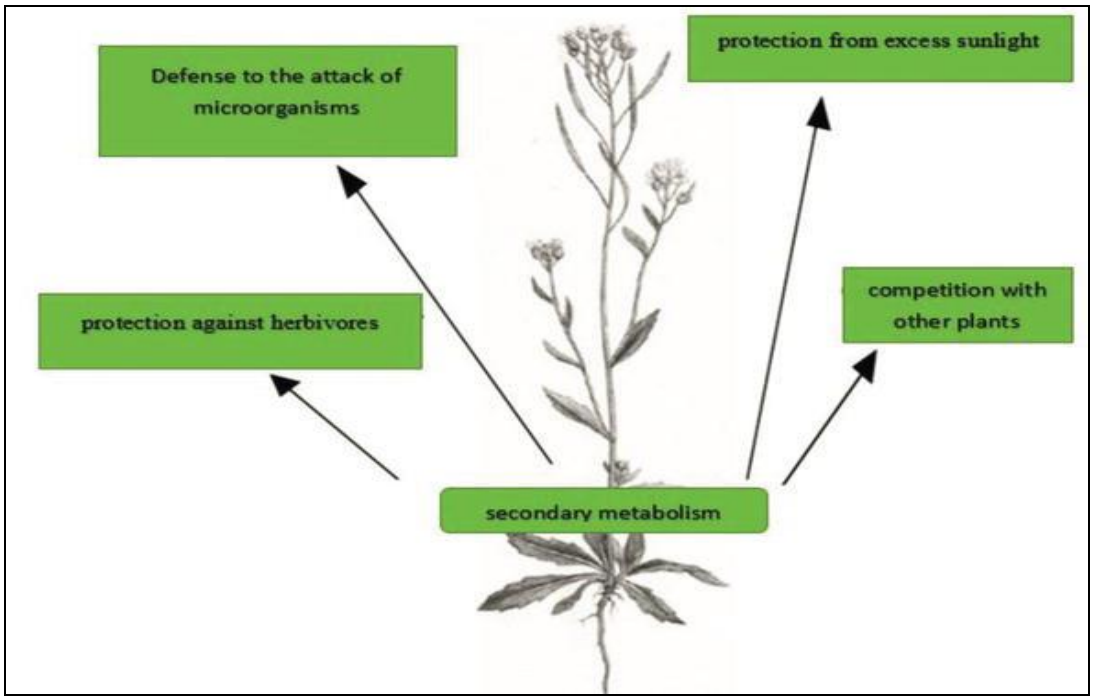

Fig 2: Function of secondary metabolites

Secondary metabolites are being the subject for many research studies because these compound exhibits many biological activities. These includes antifungal, antimicrobial, anticancer, and anti-inflammatory activities. In this study, only the antimicrobial activities of plant will be discussed

(a) Alkaloids

Alkaloids are organic heterocyclic nitrogen compounds. They contain nitrogen, which is usually derived from an amino acids. Several classes of flavonoids include pyrrolidines, tropane alkaloids, phenyalkaymines, purine and pyrrolizidines alkaloids (Carson and Hammer, 2010; savoia, 2012) [3, 10].

These metabolic compounds are grouped into three classes, depending upon the final structure and precursors of the molecule. The class include: (1) Pseudoalkaloids, which are basic but they are not derived from amino acids-includes caffeins. (2) True alkaloids, which are also basic and contain nitrogen in a hetrocyclic ring-includes nicotine. (3) Proalkaloids, which are amino acid derivatives, basic, but the nitrogen is not in a heterocyclic ring-includes phenylethylamine derived alkaloids including mesa line.

Many alkaloids effect on the nervous system. Over 3000 year ago, poppy was employed in the Middle East. And

coffee drinking originated in Ethiopia. Poppy is caffeine, narcotic and nicotine are stimulants. While cocaine is a scopolamine, and anesthetic induces "twilight sleep." Codeine, which is more common only employed by doctors to suppress sever coughing, structurally very similar to morphine. And also present on the latex of poppy capsules. Codeine is now a controlled drugs.

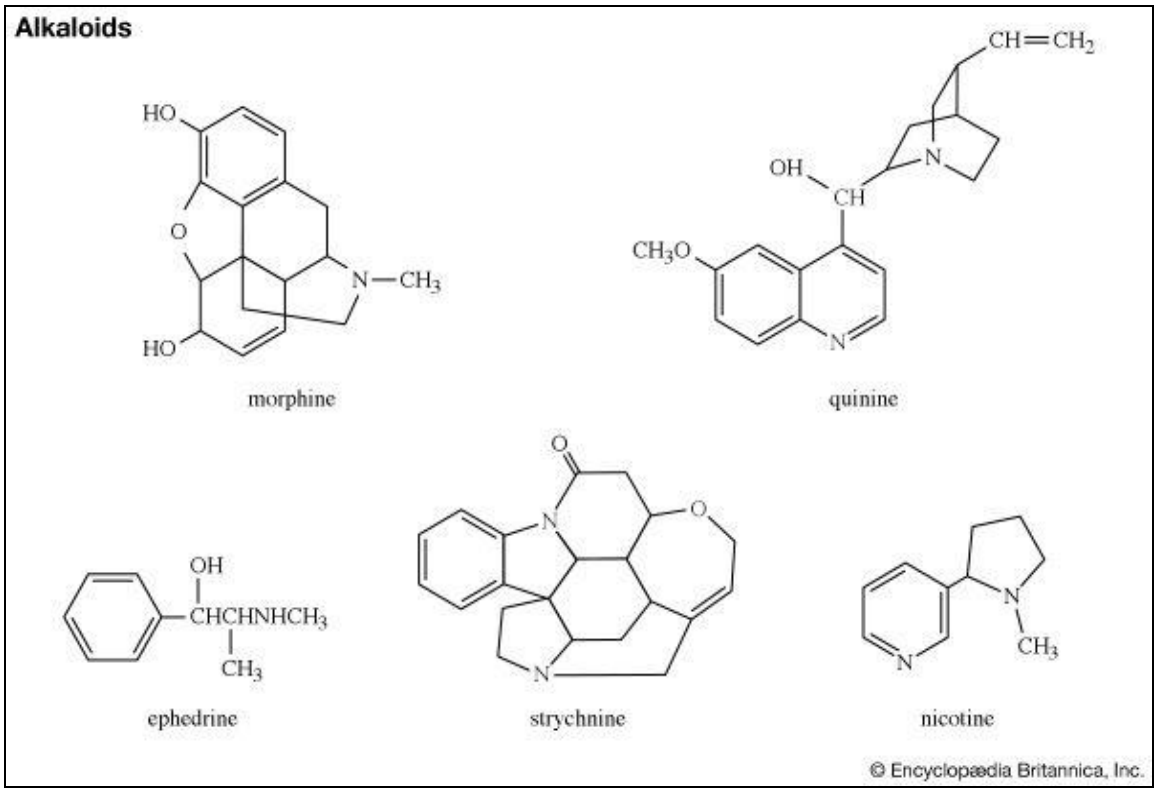

Fig 3: Structure of alkaloids

There are some natural alkaloids which show the antibacterial activity such as isoquinoline alkaloids, pyridine alkaloids, indole alkaloids, steroidal alkaloids, and other alkaloids, among which isoquinoline alkaloids and indole alkaloids represent the main types of compounds with antibacterial activity.

Antibacterial activity of natural alkaloids

There are variety of mechanisms which inhibits the bacterial growth by the natural alkaloids, including modification of the bacterial cell membrane permeability, including inhibition of the bacterial nucleic acid and protein synthesis, inhibition of bacterial metabolism, and inhibition of efflux pumps.

(b) Flavonids

Flavonoids are phenolic structure found abundantly in photosynthesizing cells. They are usually found in many common edible plant parts such as: Vegetables, nuts, fruits, seeds. Flavonoids compounds have structural feature of the flavin nucleus or 2-phenyl-benzopyrane, which consist of two benzene rings linked through a heterocyclic pyrane ring. There have been14 classes of flavonoids identified; they differ based on the position of substituent on the different rings and on the chemical nature. (Carson and Hammer, 2010; Savoia, 2012) [3, 10].

Many flavonoids are known for their antiflammatory, antitumor, antioxidant and antibacterial activity. In this study, it was demonstrate that these secondary metabolites could be participating in antibacterial activity.

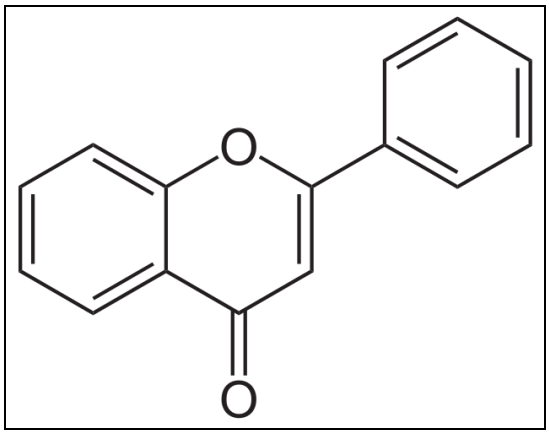

Fig 4: Structure of flavonoids

(c) Tannins

Tannins are polymeric phenolic substance found in nearly all plant part. In previous studies, tannins have been known for their different biological activities includes antibacterial and antifungal (Carson and Hammer, 2010; Savoia, 2012; Ramavat, 2007) [3, 10]. Tannins were present in high concentration for the ethanol and aqueous solution. Tannins are present in majorities of the plants, the tannins are phenolic compounds that have a molecular weight between 500 and 3000Da and soluble in water. They are able to form water soluble complexes with alkaloids and protein (Santos and Mello 2004) [9]. Due to these qualities, these compounds are responsible for the astringency of many plants (Santos and Mello 2004) [9]. The tannins are classified, according to their biosynthetic origin, into two groups. The hydrolysable

tannins, found in herbaceous and woody dicotyledons, which are chacterized by an esterified glycosidic nucleus with ellagic acid (ellagitannins) and gallic acids (gallotannins), formed from the shikimate metabolic route and the condensed tannins or proanthocyanidins, that occur mostly in angiosperm and gymnosperms and are polymers of the flava-3-ol and/or flavan-3,4-diol, derived from phenylpropanoid metabolism (Bruneton 1991; Santos and Mello 2004) [2, 9]

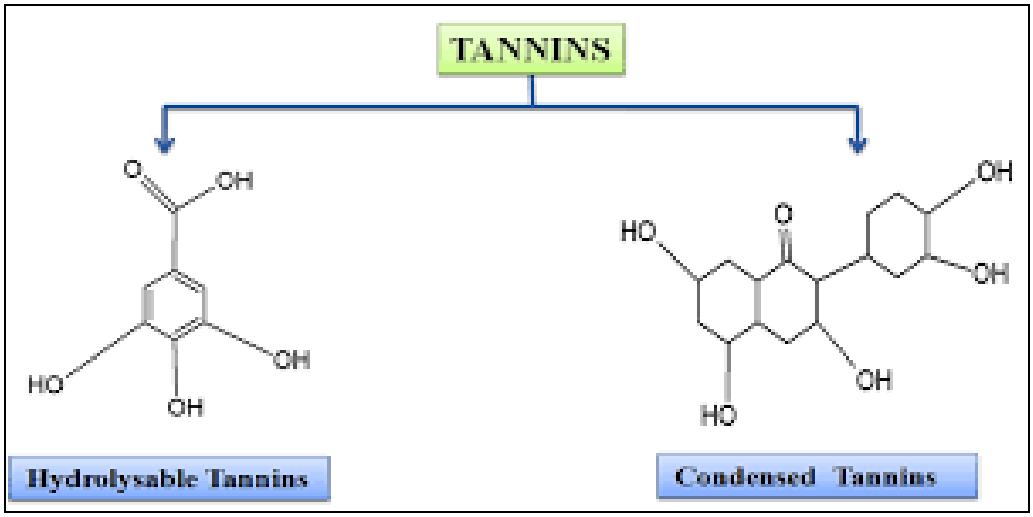

Fig 5: Structure of tannins

Saponins

Saponins is a group of natural organic compounds, due to their chemical structure appear to be glycosides, possessing high surface activity. The name of this compounds comes from Latin word "sapo" it means soap-like. At first the term "saponin" was suggested by Malon in 181 for substance, isolated from soapwort by Scheidler in 1811.

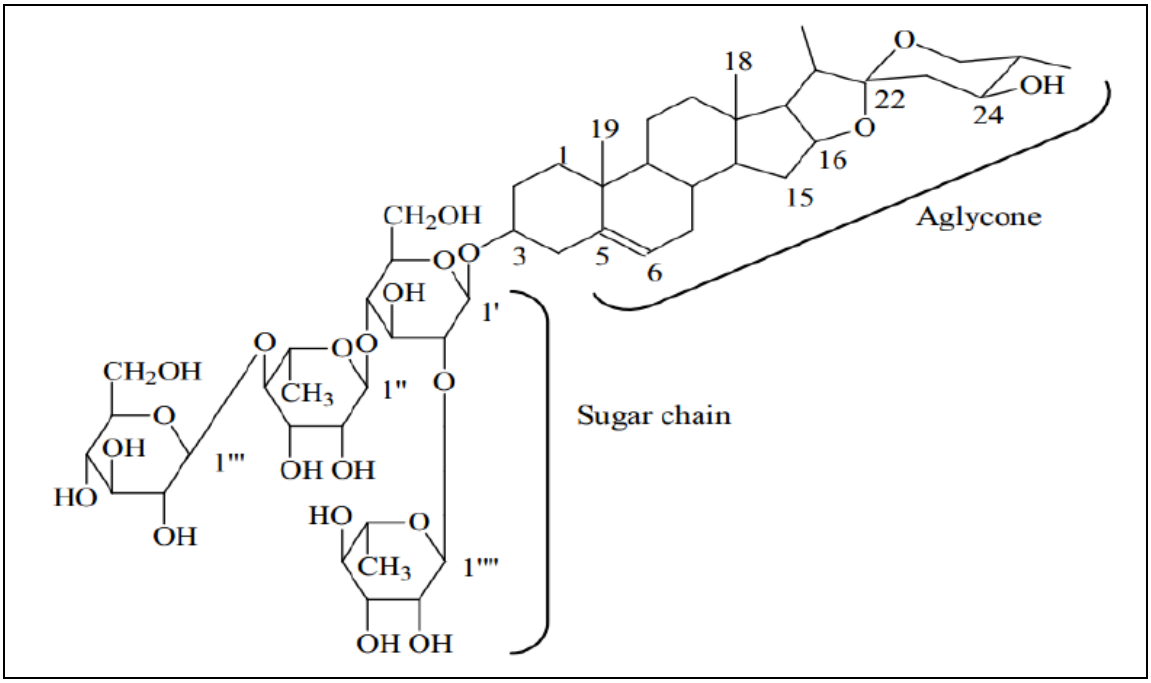

Fig 6: Structure of saponins

The sponins have multiple effect in fungi, animal's cells and bacteria. Only a few have addressed function in plants cells. Many sponins are known to inhibits mound, and to antimicrobial, and to protect plants from insect attack. Saponins is considered a part of plant, defense systems, and such have been included in a large group of protective molecule found in plants named 'phytoanticipins or phytprotectant. The first term describe those saponins, such as MMA and *B avenacosides* in oat that are activated by the plants enzymes in response to tissue pathogen or damage attack. The second describes those saponins that have a general anti-insect or anti-microbial activity.

Saponins consist of a polycylclic aglycone i.e. either a triterpenoid or choline steroid. The aglycone may contain one or more unsaturated C-C bonds. The oligosaccharides chain is attached at the C3 Position, but many saponins have an additional sugar moiety at C26 or C28 position (bidesmosidic). The third classified group is steroidal alkaloids.

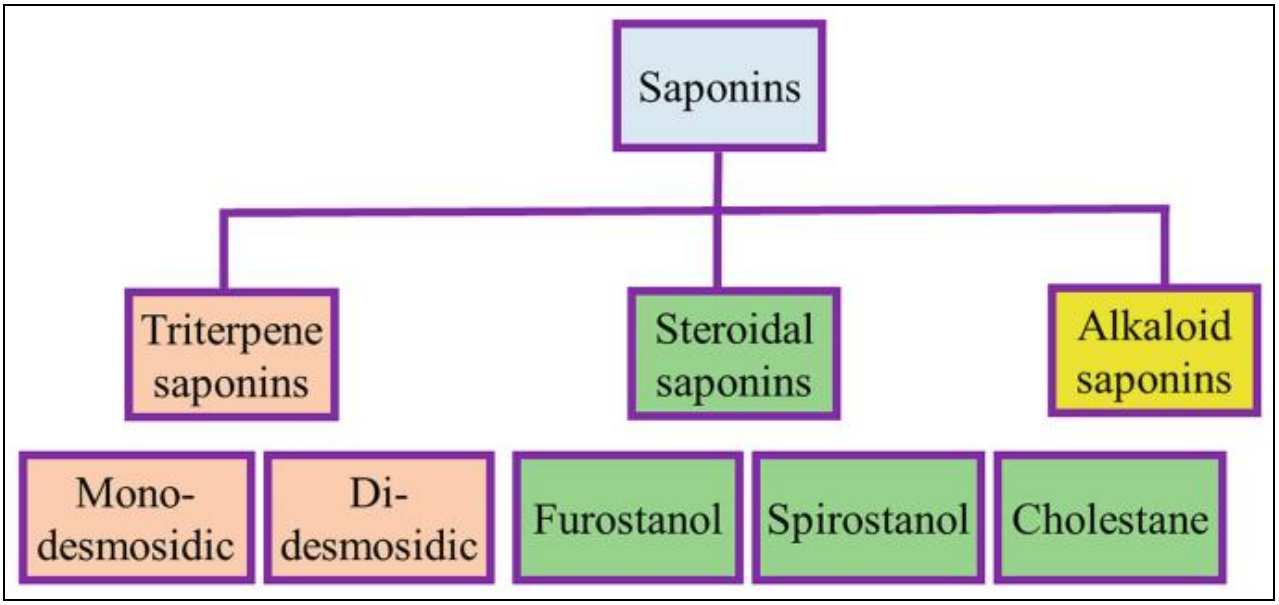

Fig 7: Classification of saponins

(d) Terpenoids

Terpenoids is a natural product and structures divided into a number of isoprene units, as it is also called the isoprenoids compounds (C_5H_8). Terpenoids are widely distributed and are found in higher plants. Terpenoids produced by fungi, marine organisms and insects, and plants. Isoprene units prepared on as acetate through melavonic acids pathway and is associated with a carbon chain containing two unsaturated bonds. During the preparation of terpenoids, two isoprene units condenses between the head and tail. Terpenoids are composed of two classes of monoterpenoids compound isoprene from ($C_{100}H_{16}$). Sesquitenes ($C_{15}H_{24}$) is composed of 3 units of isoprene from (C20H32) is composed of 4 units of isoprene, sesterces ($C_{25}H_{40}$) is composed of five isoprene, triterpenoids ($C_{30}H_{42}$) is made up of 6 units of isoprene, and tetrateroene ($C_{40}H_{64}$) is composed if eight isoprene.

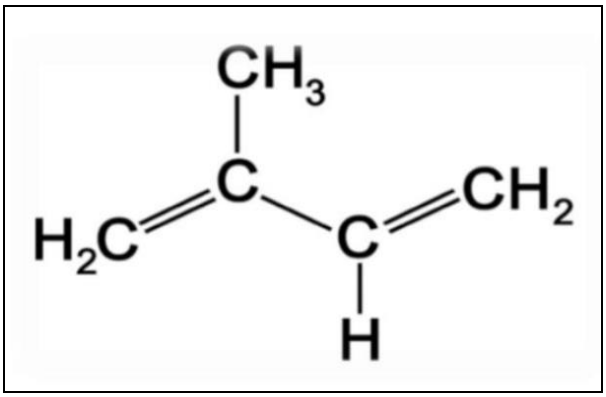

Fig 8: Structure of terpenoids

(F) Phlobatanins

Phlobatanins are natural occurring and synthesis of novel class of C-ring isomerized oligometric flavonoids, was demonstrate at the mid-1980s. These 3,4,9,10-tetrahydro-2H, 8H-pyrano chromenes are characterized by the liberated resorcinol moieties from the A/C-ring arrangement of the Parent bioflvonoids and by the conspicuous absence of effects of dynamics rotational isomerism in the ^1H NMR spectra of their parmethylaryl ether diacetates at ambient temperature.

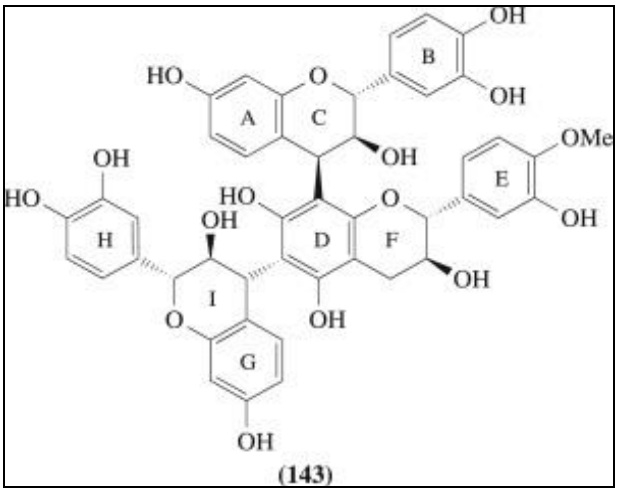

Fig 9: Structure of Phlobatanins

Materials and Methods

Qualitative phytochemicals analysis

1) Test for alkaloids

- **Mayer`s test**

1. Take 0.2 ml of concentration hydrochloric acid to 2 ml aqueous solution to crude solution extract.
2. Then 1 ml of Mayer`s reagent was added.
3. Formation of yellow colour precipitate would indicate presence of alkaloids.

2) Test for saponins

1. Take 1 ml of extract.
2. Add few drop of olive oil shake vigorously.
3. The formation of emulsion was taken as positive result for saponins.

3) Test for tannins

- **Ferric chloride test**

1. Take 5 ml of solution of the crude extract in the test tube.
2. Add 1 ml of 5% ferric solution
3. Presence of brownish black precipitate confirmed the presence of tannins.

4) Test for flavonoids

- **Alkaline reagent test**

1. Take 1ml of stock solution in test tube.
2. Add few drop of the dilute NaOH solution.
3. An intense yellow colour was appeared.
4. It became colorless when in addition of a few drop of dilute acid that indicated the presence of flavonoids.

5) Test for terpenoids

- **Salkowshi test**

1. Take 5ml solution in the test tube.
2. The add 2 ml of chloroform and 3 ml of sulphuric acid.
3. Formation of reddish-brown colour indicate the presence of terpenoids.

6) Test for Phlobatanins

1. Take 2.5 ml of solution in the test tube in the test tube.
2. Then add 1ml of 1% of hydrochloric acid (HCl).
3. Red precipitate was indicate the presence of Phlobatanins.

Results and Discussion

Data present in table 1 show the preliminary phyto-chemical examination of ethanolic crude extract of *T. pallida* showed presence of all secondary metabolites which increases its medicinal value. Phytochemicals separated in the presents study contain tannins, Phlobatanins, saponins, flavonoids, alkaloids, terpenoids. The concentration of tannin, flavonoids, alkaloids, and Saponin were high, while the terpenoids, and Phlobatanins were low. The photo activity and physiological effect of some of these phytochemical have been reported but different authors. Tannin have been reported to possess anti-inflammatory, antioxidant, analgesic as well as wound healing properties. Saponins are known to possess bitter taste, and are foamy in nature. Saponins have been reported to oppose coronary heart. Dietary flavonoids have been reported to oppose coronary heart disease. Alkaloids possess reductive effect towards fever and headache. They also possess analgesic and antibacterial properties.

Table 1: showing above test results

phytoconstituent	Leaf
Alkaloids	++
Flavonoids	++
Tannins	++
Saponins	++
Terpenoids	+
Phlobatanins	+

Conclusion

The study was aimed and intended to find out the first steps of discovery of phytochemicals which showed promising result of various kinds of important pharmacologically active secondary compound and the evaluation of different important pharmacological activities. Phytochemicals analysis of crude ethanolic extract of *T. pallida* showed the presence of flavonoids, alkaloids, terpenoids, saponins, tannins, and phlobatanins. It gives us direction for guiding biological activity to discover their potential.

T. pallida crude extract demonstrated good potential of antibacterial activity. Aqueous extract of plant is more effective than the methanolic *T. pallida* leave extract. We can considered plants as an alternative of synthetic medicines. The plant become mentioned for numerous pharmacological sports, subsequently it has extensive spectrum of sports with inside the remedy if several ailments. The isolation and characterization of phyto-constituents, elucidation of mechanism of movement of remoted compounds and scientific trails of compounds are lots needed. In the prevailing international state of affaire the hobby toward the medicinal flora has been extended for number one fitness care. Therefore, furnished records can be useful for in addition studies to display the compounds answerable for one of a kind bio activities and to clarify the molecular mechanism of movement.

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